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10/065,738	11/14/2002	Soichiro Okubo	39.003-AG	6181

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EXAMINER
JUBA JR, JOHN

ART UNIT	PAPER NUMBER
2872	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/065,738	Applicant(s) OKUBO ET AL.	
	Examiner John Juba	Art Unit 2872	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *14-17,20 and 21* is/are allowed.

6)☒ Claim(s) *1,2,4-7,9,10 and 13* is/are rejected.

7)☒ Claim(s) *3,8,11,12,18 and 19* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 November 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

Claims 4 and 10 are objected to because of the following informalities: Claims 4 and 10 recite "silicon oxide" and "titanium oxide" as the low- and high-index layers. However, the specification discloses silicon *di*oxide (SiO_2) and titanium *di*oxide (TiO_2) as the respective oxides. Thus, without loss of generality, the claims should recite *an oxide* of silicon and *an oxide* of titanium. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 9 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 9 recites a gallium-nitride semiconductor thin film that exhibits ferromagnetism at room temperature and is transparent to light. The examiner believes that as a single crystal, gallium nitride (GaN) does not exhibit room temperature ferromagnetism, and that no method was known whereby GaN could be made to exhibit room temperature ferromagnetism. Since the specification does not set forth the

manner of forming GaN at all, it is believed that one of ordinary skill would be left to undue experimentation is obtaining GaN that exhibits room temperature ferromagnetism and transparency to light. On the other hand, if the recitation of "a gallium-nitride semiconductor thin film" is so broad as to include *any* mixed crystal of gallium nitride or *doped* GaN, then the examiner notes that *some* compositions were known to exhibit room temperature ferromagnetism. Nonetheless, since the degree of ferromagnetism and the degree of transparency were known to vary fairly dramatically with the particular dopant relied upon and its concentration, and since the specification gives no guidance whatsoever as to a composition that would be suited for practice of the invention, one of ordinary skill would be left to undue experimentation in arriving at a transparent doped GaN or mixed crystal composition exhibiting room temperature ferromagnetism sufficient for use in the claimed combination with a magneto-optical part.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by TOKYO INST. of TECHN. (JP 2000-162566 A; hereinafter "TOKYO INSTITUTE") Referring to the figures and attached machine-assisted translation, TOKYO INSTITUTE disclose an assembly for selectively rotating the polarization plane of only selected wavelengths, comprising a magneto-optical part (*e.g.,* 3) and dielectric multi-layer films (1)(2) comprising alternating layers of high and low refractive index material. Since TOKYO INSTITUTE disclose the wavelengths as being rotated (*e.g.,* Fig. 5B), it will be appreciated that the light is traveling in the direction of "the magneto-optical part's magnetic field."

With regard to claim 5, notwithstanding the fact that the integrated assembly of TOKYO INSTITUTE was formed using vapor phase deposition of the dielectric layers, the recitation of the components as having been "formed integrally by a vapor-phase process" is not seen as imparting any positive *structural* limitation. The manner in which the article is made is not germane to the patentability of the article itself: "Process limitations cannot impart patentability to product claim where product is not patentably distinguished over prior art." *In re Dike*, 157 USPQ 581 (CCPA 1968). It is well-settled that the "[p]resence of process limitations in product claims, which product does not otherwise patentably distinguish over prior art, cannot impart patentability to that product." *In re Stephens,* 345 F.2d 1020 (CCPA 1965), 145 USPQ 565, citing *Dilnot.*

Claims 1, 2, 4 – 7, 10 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by RICOH CO LTD (JP 11-030770 A; hereinafter "RICOH"). Referring *for example* to Figure 1 and the attached machine-assisted translation, RICOH disclose a magneto-optical part (2) and dielectric multi-layer films (3)(4) comprising alternating layers of high and low refractive index material. Since RICOH disclose the wavelengths as being rotated (*e.g.,* Fig. 5B), it will be appreciated that the light is traveling in the direction of "the magneto-optical part's magnetic field." The recitation of the rotator as selectively rotates the polarization plane of incident light only of given wavelengths, is functional, and describes the rotator in terms of *what it does* rather than *what it is.* That is, this recitation is not seen as imparting any positive structural limitation to the claimed structure as would distinguish over the structure of RICOH. In any event, the examiner believes that the description of the combination as causing "multiple echo" (para. [0013]) fairly conveys that the resonant structure performs in the recited manner.

With regard to claim 6, *et seq.,* RICOH disclose the further combination with polarizers (7) and (8) and a magnetic part ("bar magnet" ;para. [0030]). Thus, RICOH disclose all of the positively recited structure. Further, it is believed in the display embodiment, operation is that of an optical isolator.

With regard to claims 4 and 10, the alternating layers are silicon oxide (SiO_2) and titanium oxide (TiO_2) are generally sufficient (para. [0021]).

With regard to claims 5 and 13, notwithstanding the fact that the integrated assembly of RICOH comprises vapor phase deposited dielectric layers, the recitation of the components as having been "formed integrally by a vapor-phase process" is not

seen as imparting any positive *structural* limitation. As previously set forth, it is well-settled that the manner in which the thing is made is not germane to the patentability of the thing itself.

Claims 1, 2, 5, 6, 7, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Matsushita, et al (U.S. Patent Application Pub 2002/0063941 A1). Referring initially to Figure 6 and the associated text and noting the detailed construction of assembly 10A shown in Figure 1, Matsushita, et al disclose an optical isolator having wavelength selectivity comprising a magneto-optical part (*e.g.,* 31), a magnetic part (4), a dielectric multi-layer film (30) comprising alternating layers (24)(25) of high and low refractive index material, and polarizers (2A)(2B).

With particular regard to claims 2 and 7, the coupled cavity Fabry Perot structure is believed to have a response that is periodic. That is, localization and enhancement of the Faraday rotation will be achieved for resonant wavelengths.

With regard to claims 5 and 13, notwithstanding the fact that the integrated assembly of Matsushita, et al involves vapor phase deposition of the dielectric layers, the recitation of the components as having been "formed integrally by a vapor-phase process" is not seen as imparting any positive *structural* limitation. As previously set forth, it is well-settled that the manner in which the thing is made is not germane to the patentability of the thing itself.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6, 7, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over TOKYO INST. of TECHN. (JP 2000-162566 A; hereinafter "TOKYO INSTITUTE"), in view of Official notice. TOKYO INSTITUTE disclose an assembly for selectively rotating the polarization plane of only selected wavelengths, comprising a magneto-optical part (*e.g.,* 3) and dielectric multi-layer films (1)(2) comprising alternating layers of high and low refractive index material. Since TOKYO INSTITUTE disclose the wavelengths as being rotated (*e.g.,* Fig. 5B), it will be appreciated that the light is traveling in the direction of "the magneto-optical part's magnetic field." Notably, TOKYO INSTITUTE suggest the assembly for use in an optical isolator (last sentences in [0018] & [0022]). Thus, TOKYO INSTITUTE disclose the invention substantially as claimed, but do not expressly disclose the combination as comprising a magnetic part, a polarizer, and an analyzer, as recited.

The examiner takes Official notice of the fact that in an optical isolator employing a (non-latching) Faraday rotator, a magnetic part, a polarizer, and an analyzer were well-known to be components vital to the combination, if isolation is to be achieved.

It would have been obvious to one of ordinary skill to employ a magnetic part, a polarizer, and an analyzer in the optical isolator of TOKYO INSTITUTE, in the interest of achieving isolation due to polarization rotation by the Faraday rotator, as was well-known.

With regard to claim 13, notwithstanding the fact that the integrated assembly of TOKYO INSTITUTE comprises vapor phase deposited dielectric layers, the recitation of the components as having been "formed integrally by a vapor-phase process" is not seen as imparting any positive *structural* limitation. As previously set forth, it is well-settled that the manner in which the thing is made is not germane to the patentability of the thing itself.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over TOKYO INST of TECHN. (JP 2000-162566 A; hereinafter "TOKYO INSTITUTE"), in view of RICOH CO LTD (JP 11-030770 A; hereinafter "RICOH"). As set forth above for claim 1, TOKYO INSTITUTE disclose the invention substantially as claimed. However, TOKYO INSTITUTE do not disclose silicon oxide (SiO_2) and titanium oxide (TiO_2) as the low- and high-index layers.

In the same field of endeavor, RICOH a disclose a Faraday rotator arranged between alternating transparent dielectric layers in order to localize and enhance the magneto-optical effect. For this purpose RICOH teach that a variety of dielectric layer combinations can be used, but that silicon oxide (SiO_2) and titanium oxide (TiO_2) are generally sufficient (para. [0021]). One of ordinary skill would understand this to be a

teaching of using the ubiquitous silica/titania combination known for its low cost attributable to its deposition parameters and relatively abundant raw materials.

It would have been obvious to one of ordinary skill to employ silicon oxide (SiO_2) and titanium oxide (TiO_2) as the dielectric layers in the Faraday rotator of TOKYO INSTITUTE, because these layers were an art-recognized equivalent for the purpose, as taught by RICOH. In the instant case, one of ordinary skill would have been motivated to select the titanium oxide over tantalum oxide in the interest of using a lower-cost sputtering target.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over TOKYO INST. of TECHN. (JP 2000-162566 A; hereinafter "TOKYO INSTITUTE"), in view of Official notice, and further in view of RICOH CO LTD (JP 11-030770 A; hereinafter "RICOH"). As set forth above for claim 6, TOKYO INSTITUTE suggests the invention substantially as claimed. However, TOKYO INSTITUTE do not disclose silicon oxide (SiO_2) and titanium oxide (TiO_2) as the low- and high-index layers.

In the same field of endeavor, RICOH a disclose a Faraday rotator arranged between alternating transparent dielectric layers in order to localize and enhance the magneto-optical effect. For this purpose RICOH teach that a variety of dielectric layer combinations can be used, but that silicon oxide (SiO_2) and titanium oxide (TiO_2) are generally sufficient (para. [0021]). One of ordinary skill would understand this to be a teaching of using the ubiquitous silica/titania combination known for its low cost attributable to its deposition parameters and relatively abundant raw materials.

It would have been obvious to one of ordinary skill to employ silicon oxide (SiO_2) and titanium oxide (TiO_2) as the dielectric layers in the Faraday rotator of TOKYO INSTITUTE, because these layers were an art-recognized equivalent for the purpose, as taught by RICOH. In the instant case, one of ordinary skill would have been motivated to select the titanium oxide over tantalum oxide in the interest of using a lower-cost sputtering target.

Allowable Subject Matter

Claims 14 – 17, 20, and 21 are allowable over the prior art. Claims 3, 8, 11, 12, 18, and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art, taken alone or in combination, fails to teach or to fairly suggest

a magneto-optical part in combination with a dielectric multi-layer film of alternating low-index and high-index layers for localizing within said magneto-optical part incident light of at least one wavelength, particularly wherein the magneto-optical part is constituted from a gadolinium iron garnet thin film, as recited in claims 3 and 8;

a polarizer in which a diamond-like carbon film has distributed refractive indices along a bias with respect to the film's thickness, as recited in claim11 and 14; or

a diamond-like carbon thin film having an extinction coefficient no greater than 3×10^{-4} over the spectral range of 1200 – 1700 nm, as recited in claim 16.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Mearini, et al (US 2002/0003665 A1) disclose diamond-like carbon as being virtually loss-less (more than 99% transmissive) for wavelengths between 800 – 15000 nm.

Inoue, et al (U.S. Patent number 6,421,303) disclose a magneto-optical *storage medium* comprising alternating layers of silica and titania sandwiching a magnetic layer to effect localization and enhancement of Faraday rotation, the combination being integrated by vapor phase deposition.

Nordal, et al disclose a polarizer function attributable to the relief structures formed in a diamond-like carbon layer (Col. 4, lines 7 – 11).

Hirano, et al disclose a diamond-like carbon (DLC) layer having a graded refractive index.

Schmidt, et al disclose filter tuning by varying the refractive index of a DLC layer in accordance with its hydrogen content (Figs. 13 & 14; Table II).

SEMICONDUCTOR ENERGY LAB CO (JP 05-273425 A) disclose a method of depositing DLC films suitable for use in the infra-red.

JAPAN SCIENCE & TECHNOLOGY (JP 2002-260922 A) disclose GaN crystals doped with various transition metals to achieve ferromagnetism.

JAPAN SCIENCE & TECHNOLOGY (WO 02/070793 A1) disclose GaN crystals doped with various transition metals to achieve ferromagnetism.

RICOH CO LTD (JP 2000-267057 A) disclose enhancement of a magneto-optical effect by interleaving rare-earth iron garnet layers with dielectric layers.

I.A. Faizrakhmanov, et al (*Vacuum*) discuss the optical properties of DLC films bombarded with Xe^+ ions.

I.A. Faizrakhmanov, et al (*Semiconductors*) discuss the optical properties of DLC films bombarded with C^+ ions.

Ken-ichi Kawamura, et al (*Jpn. J. Appl. Phys.*) discuss use of interfering pulsed energy beams to pattern a diamond substrate with refractive index variations attendant a change of state to diamond-like or amorphous carbon.

Jing Wang, et al (*Surface and Coatings Techn.*) discuss the optical properties of DLC films bombarded with CH^{n+} ions.

W.J. Wang, et al (*Thin Solid Films*) discuss the optical properties of DLC films bombarded with N^+ ions.

V Palshin, et al (*Thin Solid Films*) discuss the optical properties of ion beam deposited DLC films.

G.A. Clarke, et al (*Thin Solid Films*) disclose extinction coefficients for DLC films in the visible range resulting from various sputtering conditions.

M.E. Overberg, et al (*Appl. Phys. Lett.*) disclose a GaMnN composition exhibiting ferromagnetism.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on Mon.- Thu., 9 - 5. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

John Juba
Primary Examiner, GAU 2872

January 30, 2003